1. $\int \frac{dy}{2y} = \int (3-x)\,dx$

a) $\frac{1}{2}\ln|2y| = 3x - \frac{x^2}{2} + C$

b)

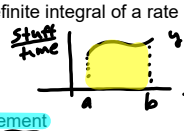
c) logistic

⋮

Dec 5-9:21 AM

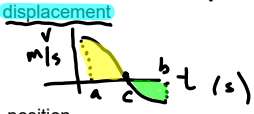
7.1 Integral as Net Change

The definite integral of a rate of change gives the net change.



$\int_a^b f(t)\,dt$ what units? $\frac{\text{stuff}}{\text{time}} \cdot \text{time} = \text{stuff}$

displacement



$\int_a^b v\,dt = (x(f) - x(i))$ m

final pos − initial pos.

position

$x(f) = \int_a^b v\,dt + x(i)$

final pos initial pos

total distance

$\int_a^c v\,dt + \left|\int_c^b v\,dt\right|$

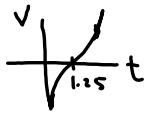
Dec 13-9:41 PM

The velocity of a particle moving along the x-axis is given by:

$$v(t) = t^2 - \frac{8}{(t+1)^2}$$

a) Describe the motion
b) The initial position of the particle is s(0)=9, what is the particle's position at t=1? at t=5?
c) Find the total distance traveled from t=0 to t=5.

a)



starts out moving left.
stops at $t = 1.25$
Then moves right

b) $x(1) = \int_0^1 v\,dt + 9 = 5.3\overline{3}$

$x(5) = \int_0^5 v\,dt + 9 = 44$

c) $\left|\int_0^{1.25} v\,dt\right| + \int_{1.25}^5 v\,dt = 42.5868$

Dec 13-9:54 PM

Integral of a rate of change gives the total accumulation.

Potato Consumption - From 1970 to 1980 the rate of potato consumption was

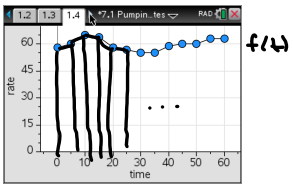
$$C(t) = 2.2 + 1.1^t$$

millions of bushels per year, with t being years since the beginning of 1970. How many bushels were consumed from the beginning of 1972 to the end of 1973?

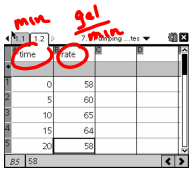
$\int_2^4 2.2 + 1.1^t\,dt = 7.07$ Mbu

Dec 13-9:59 PM

A pump connected to a generator operates at a varying rate shown in the table. How many gallons were pumped during the hour?



f(t)



Total Gallons $= \int_0^{60} f(t)\,dt \approx$ Trap

$\frac{5}{2}[58 + 2\cdot 60 + 2\cdot 65 + \cdots + 63]$

$\frac{5}{2}(2 * \text{sum(rate)} - 58 - 63) \approx 3582$ gal

Dec 13-10:10 PM

Work done by a constant force: W = F*d

Work done by a variable force: $W = \int_a^b F(x)\,dx$

It takes a force of 10N to stretch a spring 2m beyond its natural length. How much work is done in stretching the spring 4m from its natural length?

$F = k \cdot x$

$10 = k \cdot 2$

$k = 5$

$\int_0^4 5x\,dx = 40$ Nm

$= 40$ J

Dec 13-10:20 PM